Brit. Heart J., 1964, **26**, 697.

PROCEEDINGS OF THE BRITISH CARDIAC SOCIETY

The FORTY-THIRD ANNUAL GENERAL MEETING of the British Cardiac Society was held in the University Department of Physiology, Oxford, on Thursday, April 9, 1964. The President, EVAN BEDFORD, took the Chair at 9.30 a.m. during Private Business before handing over to the Chairman, P. R. ALLISON.

PRIVATE BUSINESS

1. The Minutes of the Annual General Meeting having been published in the Journal (1964, **26**, 135) were taken as read and confirmed.

2. The following alterations to the Rules of the Society were confirmed.

   Rule 6 to read:
   Ordinary Members shall be Physicians or Surgeons on the Consultant Staff of a hospital or others whose primary interest is in the practice of Cardiology, Cardiovascular Surgery, or in research in these and allied subjects.

   Rule 7 to read:
   Ordinary and Associate Members shall not exceed 300 in number, including those who may be elected for their interest in Cardiovascular Surgery (Surgical Members).

   Rule 10 to read:
   Associate Members shall be elected from those engaged in research in Cardiovascular problems, in the practice of Cardiology or in Cardiovascular Surgery. Their numbers, added to those of the Ordinary Members, shall not exceed 300, and not more than 15 new Associate Members shall be elected in any year. They shall take part in the Scientific Business and may attend, but not take part in, the Private Business of the Society.

   Rule 4 to be amended:
   Delete the last word "annually" and add "for each meeting".

   Rule 22 to be amended:
   After "the Chairman Elect" add "Chairman of the Annual Meeting".

3. In view of the increasing number of papers being submitted to the Society it has been felt necessary to increase the number of days during the year at which papers may be presented. The following Resolutions were passed:
   1. That the Annual Meeting of the Society should be expanded to two days and that pending further experience the Autumn Meeting should continue as a one-day fixture.
   2. The Annual Meeting would normally be held at a University Centre but there is nothing to prevent the holding of the Meeting elsewhere, the location to be decided by the Council.

4. The Treasurer reported that the Society's financial position remained sound. The current account contained £706, and £529 was invested, both under the General Fund. The Congress Fund now held £1,189. An Auditor had now been appointed for the Society's finances.
   The Sir Thomas Lewis Lecture Fund held £1245 capital, and received £49 per annum income from investments and tax rebate. The policy of the Fund would be to pay up to £100 towards the expenses of each lecture, which would be held every two years. The expenses of the last year's lecture came to £67.
   The expenses of the Society had increased strikingly in the past year as compared with previous years, the increase being £442. This difference was made up mainly by an increase in secretarial expenses, from £126 in 1962/3 to £339 in 1963/4. The cost of the meetings had increased from £60 to £171, and of subscriptions to other societies from £70 to £140. In the past year expenditure had exceeded income by £96.

The annual income of the Society was £650 derived from members' subscriptions, interest from investments, and tax rebate. The expenditure in future years, with the introduction of two-day meetings, would undoubtedly increase to between £800–£900 per annum. This increase could not be met by the increase in the number of members, and the Council felt that an increase in members' subscriptions must be advised within the next year. The exact amount would be decided in due course. The Treasurer regretted the need for a larger subscription but pointed out that the affairs of the Society were becoming more extensive and more complex and therefore increased expenditure was inevitable. The Treasurer also reminded members that there had been no increase in subscriptions since the number of issues of the Journal was increased from four to six in the year. A firm basis of investments was regarded by the Council as of paramount importance.

5. Evan Bedford had tendered his resignation as President of the Society and Shirley Smith was elected President.

6. The following two new *Members of the Council* were elected in place of Brigden and Wood: C. J. Gavey and Frederic Jackson.

7. The following *Honorary Member* was elected.

   D. Evan Bedford

8. The following *Extra-Ordinary Member* was elected.

   L. B. Cole

9. The following *Corresponding Members* were elected.

   L. Dexter (Boston, U.S.A.)
   G. E. Burch (New Orleans, U.S.A.)
   Pentti Halonen (Finland)

10. The following Members had resigned.

    R. G. Anderson
    R. Ellis
    T. Hanley
    J. C. Hoyle
    R. W. Luxton
    E. A. F. Priest
    T. B. Smiley (SM)
    G. M. Wilson

11. The following *Ordinary Members* were elected.

    From Associate Membership:

    N. Coulshed
    H. A. Fleming
    M. Honey
    G. Howitt
    A. M. Johnson
    M. K. Towers

    As *New Members:*

    Brian Bronte-Stewart (Glasgow)
    George Simon (London)

12. The following *Associate Members* were elected.

    David Hywel Davies (London)
    Brian Leonard Pentecost (London)
    John Paget Harry Davies (London)
    John Russell Rees (London)
    Marion Farmer (Newcastle upon Tyne)
    Brian Fyffe Robinson (London)
    John Robinson (London)
    M. J. Goldberg (London)
    John Guthrie Stevenson (Glasgow)
    Vivian Michael Leveaux (Derby)
    Ronald Nixon Ross (SM) (London)
    John Burnett McGuinness (Glasgow)
    Samuel Griffin Owen (Newcastle upon Tyne)

13. The following *Overseas Members* were elected.

    L. Davidson (Southern Rhodesia)
    J. Harries (Kenya)
    P. Turner (Uganda)

14. The 1964 Autumn Meeting is to be held in London, the date to be decided.

15. The 1965 Annual General Meeting is to be held in Liverpool, the date to be decided.

16. William Evans asked that if Members had any suitable cardiological books that could be spared they should be sent to the Society of Cardiology Technicians to supplement their library.

Demonstrations were held in the University Department of Physiology. The Society dined together in Magdalen College Hall with Allison in the Chair. Evan Bedford proposed Allison's health and Allison replied. Sir Lindor Brown was the guest of honour.

Scientific Business

Factors Affecting the Life of Untreated Ostium Primum Atrial Septal Defect

By Jane Somerville

In 122 patients with ostium primum defect, aged 11 days to 69 years, factors that caused disability and death have been studied. Fifteen were considerably disabled and 12 died naturally. When death occurred in infancy (2 patients) the ostium primum was complicated by coarctation of the aorta. Five patients, under 10, who had severe mitral regurgitation and very large defects, were disabled by dyspnœa and chest infections, and two of them died in acute attacks. Most of the other patients below 30 had little or no limitation except those with associated pulmonary stenosis in whom dyspnœa was a prominent symptom.

The relatively few patients over 30 (26 cases) suggests that survival to the fifth and sixth decades may be unusual; only 5 of these were without severe symptoms. Severe pulmonary hypertension was rare in the series and accounted for death from right heart failure in only 2 patients. Mortality and disability from dyspnœa and congestive heart failure were usually related to the development of paroxysmal or established arrhythmias. These were complete heart block, nodal bradycardia or tachycardia, and atrial fibrillation. Sudden death, sometimes heralded subjectively by giddy or syncopal attacks and objectively by further prolongation of the P–R interval, occurred irrespective of the age of the patient or size of the defect.

Atrio-ventricular Defects

By D. Evan Bedford, T. Holmes Sellors, and Walter Somerville

Forty-five patients with atrio-ventricular defect have been submitted to operation and the selection of patients and the results of operations are considered in this paper. Forty were examples of ostium primum defects and 5 were true atrio-ventricular canals.

The condition affects women more than men (28 to 17), a lower incidence than in ostium secundum defects. Almost half were operated on between the ages of 11 and 20 years.

The diagnosis of these defects is based on the signs of an atrial septal defect, plus signs of regurgitation through the A-V valves. The electrocardiographic changes are important, a right bundle-branch block occurring in the presence of left axis deviation (44 out of 45). Patients with significant pulmonary hypertension are more likely to be A-V canals. Associated defects are common: 5 cases of left superior vena cava, 9 of foramen ovale defects, 1 of coarctation, and 1 of pulmonary valve stenosis. A deformed and cleft mitral valve was seen in every case, and in one-third the tricuspid septal leaflet was split or abnormal.

The surgical repair consisted of opening the right atrium after whole-body perfusion (Mayo Gibbon) had been established. The cleft valves were sutured or repaired so as to render them competent and the crescentic defect was closed by a patch of synthetic material or pericardium. Sutures applied to the top of the ventricular septum and close to the coronary sinus could damage the A-V bundle or node and produce heart block (7 cases, 4 recovered).

The mortality in ostium primum defects was 12·5 per cent (5 deaths), but 3 out of 5 A-V canals died without leaving hospital (2 of these had severe pulmonary hypertension). Bacterial endocarditis with vegetations on the patch was responsible for 2 of the hospital fatalities. One further death four years after operation occurred from heart failure due to unrelieved mitral insufficiency.

Heart block is the most important complication and in permanent cases it was noted that the P–R interval was prolonged before operation. The block is not necessarily the result of direct trauma as it occurred some days after the operation.

Post-operative catheterization in 22 patients (out of 36 survivors) showed a persistent L–R shunt in 5 cases, but in 3 of these the defect closure has been by direct suture and not by patch.

The interpretation of physical signs and murmurs is difficult, but if mitral incompetence persists deterioration may well be expected. Radiologically the decrease in heart size is less than might be expected. Finally, where there were pre-operative symptoms, these have diminished in all those patients who did not develop cardiac failure.

A Review of 81 Consecutive Cases of Open Heart Surgery Performed Under Profound Hypothermia (Drew Technique)

By T. B. Boulton, P. Ghadiali, R. L. Hurt (*all introduced*), and O. S. Tubbs

Operations on the heart under vision requiring more than 8 minutes of circulatory arrest are usually undertaken using some form of cardiopulmonary bypass, but Drew has practised an alternative method in which the patient's body temperature is reduced to 12°C. ("profound hypothermia") using the patient's own lungs for respiratory exchange.

We first used this method for open-heart surgery in November 1961 and to date (31.1.64) have carried out 81 operations by this technique. Profound hypothermia provides perfect operating conditions, but is criticized on the grounds that it is said to cause serious metabolic disturbance and has been known to result in irrecoverable brain damage. In our series there has been no evidence of permanent brain damage due to the profound hypothermia, and metabolic disturbance has usually been slight and easily corrected. There has been no instance of serious renal failure. Up to the present time 10 of the 81 patients have died following the operation. The age of the patients has varied from 3 to 68 years. The method has been found particularly useful in operations known to be hazardous using cardiopulmonary bypass, for example there have been 18 cases of Fallot's tetralogy submitted to total correction with 2 deaths and 17 cases of calcific aortic stenosis (average age 52) treated by valvuloplasty with 3 deaths. Sufficient time to insert a prosthetic aortic valve is provided by profound hypothermia (3 cases).

The limitations and disadvantages of profound hypothermia compared with cardiopulmonary bypass are enumerated, and reference is made to each of the fatal cases in the series.

Total Correction of the Tetralogy of Fallot in Young Children and Infants

By I. K. R. McMillan, A. M. Johnson, and E. S. Machell (*introduced*)

Total correction of the tetralogy of Fallot is universally performed in subjects over the age of 5 years, but we report now total correction in 9 cases between the age of 10 months and 5 years with weights between 6·7 and 14 kg. All the patients had severe symptoms demanding surgical relief and the criteria for choosing the operation for total correction in this group are discussed.

The operations were carried out using cardiopulmonary bypass and deep hypothermia and the method used is described. The importance of closing a patent foramen ovale, if present, is briefly discussed.

Results during a follow-up period of seven months to two years are reported. There was one death. Of the 8 survivors, 7 show an excellent result. In one, the ventricular septal defect has reopened but the child is improved and has a less severe degree of Fallot's tetralogy than before.

Surgical Treatment of Mitral Incompetence

By Andrew Logan, Richard Turner, Arthur Kitchin, Clifton Lowther, David Wade, Robert MacCormack, Philip Wallbaum, and Benjamin LeRoux (*the last four introduced*)

The surgical treatment of mitral incompetence by repair or by replacement of the valve under direct vision is a relatively new procedure, and as yet there has been no communication to the Society on this subject.

Between October 1962 and December 1963, 31 patients from the Cardiac Department of the Western General Hospital in Edinburgh were treated for this condition with the bypass technique, 22 by repair and 9 by replacement. This paper is concerned with the 22 patients treated by repair.

Since the follow-up is inevitably short the paper is in the nature of a preliminary report and related to the selection of cases and pre-operative investigations, to operative findings, techniques and mortality, and preliminary results.

Before operation 15 patients were graded as moderately severe, 4 were graded as severe, and 3 were graded as very severe. Apart from symptoms, severity was mainly considered to be related not to the degree of valvular incompetence, as far as this could be assessed, but to the more important factors of myocardial damage as judged by cardiac enlargement, congestive failure, and the cardiac output, and of the pulmonary vascular resistance.

Of the 22 patients, 3 died as a result of the operation: all were in the very severe group.

It is clear that in the good and moderately good risk groups the surgical mortality for repair is low. The chief interest therefore centres on the long-term results. So far no patient has died in the follow-up period and it is not considered that any patient has been made worse by the operation.

Symptomatically all claim to be improved. The mitral systolic murmur was eliminated in a few and considerably reduced in all but one. One feature of the follow-up period has been the return in some degree of an apical systolic murmur, though in none has it approached its previous intensity. So far there has been no return of a previously present third heart sound.

Reference is also made to the radiological and electrocardiographic changes.

Internal or External Pacemaker?

The Results of Long-term Endocardial Pacing with an Electrode Catheter

By Eileen R. Busby, A. M. Harris (*both introduced*), Aubrey Leatham, Harold Siddons, and J. G. Davies (*introduced*)

The use of the intravenous electrode catheter for pacing in heart block avoids a thoracotomy, but if the catheter is brought through the skin to an external pacemaker there is a risk of septicæmia. This is avoided by implanting the pacemaker. In the technique we have developed it is buried in the axilla.

We report the results of long-term venous route pacing for 28 patients with external and 11 patients with implanted pacemakers (total 36 patients). To date the longest periods of pacing with external and internal units are 25 months and 6 months respectively.

The risks of septicæmia, displacement of the electrode tip within the heart, and pacemaker failure will be considered and reasons given for choosing a single rather than a bipolar electrode catheter.

Of the 36 patients, 32 survive.

Post-operative Hæmodynamic Studies in Hypertrophic Obstructive Cardiomyopathy

By C. M. Oakley, P. M. Shah (*introduced*), R. E. Steiner, W. P. Cleland, H. H. Bentall, and J. F. Goodwin

Twelve patients underwent operation. Their main symptoms were syncope, angina, and shortness of breath. Recurring syncope, regarded as of sinister implication, was present in 7 patients. Only one lacked grave disability but two of his sibs with the disease had previously dropped dead.

Surgical treatment has only been carried out on patients who were thought to be in danger of sudden death and whose symptoms were disabling. Patients with predominantly right-sided involvement or whose main difficulty was in ventricular filling were not selected. Operation was carried out under cardiopulmonary bypass. The left ventricle was approached via the aorta; varying amounts of hypertrophied muscle were removed, deep longitudinal incisions were made in the hypertrophied muscle ("ventriculomyotomy"), and left bundle-branch block was produced in all except two.

Of the patients operated on 3 died, 2 from complete heart block induced during resection of septal muscle; 9 are alive, 7 much improved, and 2 of these have lost all symptoms.

In these patients, regression of murmurs together with loss of the hyperkinetic arterial pulse gives objective evidence of benefit which has been confirmed by full post-operative hæmodynamic and angiographic studies. In 4 patients, the left ventricular outflow gradient has been virtually abolished, but in 2 who have derived least symptomatic benefit and who retain clinical evidence of obstruction, the hæmodynamics are not greatly changed. Mitral regurgitation has improved *pari passu* with reduction in left ventricular outflow gradient. Where obstruction has been abolished mitral regurgitation has disappeared, whereas persistent outflow gradients have been associated with persistent mitral incompetence.

The reasons for improvement after operation are discussed, and the effects of inotropic and aninotropic drugs before and after operation are presented.

Studies on Dyspnœa in Heart Disease

By Hywel Davies and Nikos Gazetopoulos (*introduced by Charles Baker*)

This communication is concerned with the factors responsible for dyspnœa in heart disease. Three groups have been studied: rheumatic valvular disease, congenital disease with left-to-right shunt, and congenital disease with cyanosis. Studies have been performed at rest and on effort, both at cardiac catheterization and on a bicycle ergometer. Particular attention has been paid to the hæmodynamic response, to alterations in blood gases, to the lactate-pyruvate economy, and to abnormalities in lung function.

Different patterns of behaviour have been observed in each group, and the influence of each in the determination of disability assessed. In the patients with rheumatic valvular disease the dominant influence of left atrial hypertension is evident. In those with left-to-right shunts the effects of disturbed lung function and of systemic blood flow in relation to lactate and pyruvate metabolism is discussed. In the patients with cyanotic disease the special factor of a rising P_{CO_2} on effort is seen, acting at times in the presence of profound hypoxæmia and respiratory acidosis.

Though of different causation in each group, the unifying theme emerges that disturbance of the function of the lungs lies at the root of the effort disability of these forms of heart disease.

Cine-angiography of the Mitral Valve

By R. S. O. Rees (*introduced by A. Leatham*), K. E. Jefferson, and A. M. Harris (*introduced by A. Leatham*)

Cine-angiocardiograms in the right anterior oblique projection following injection of contrast medium into the left ventricle have been obtained in 25 patients with mitral valve disease. These have been studied with particular reference to assessing the degree of regurgitation, the movements of the cusps, and the nature of the structural abnormality in the valve. The conclusions are correlated with the clinical, operative, and necropsy findings. The material includes patients with mitral stenosis, mixed mitral stenosis and regurgitation, and pure mitral regurgitation including two with rupture of the chordæ tendineæ. Representative cine-angiograms are shown.

Pulsatile Flow in the Pulmonary Circulation: A Cinefluorographic Study

By A. R. Chrispin (*introduced*) and R. E. Steiner

This communication describes an investigation into the nature of the pulmonary blood flow using a cinefluorographic technique during a continuous slow injection of contrast medium into the pulmonary circulation.

Fifteen examinations were carried out. Contrast medium was injected in 3 different positions into the pulmonary artery: into a main lobar artery, into a small segmental artery, and into a lobular artery in the "off-wedge" position. The injections were timed very accurately with an electrically operated stopwatch running synchronously during the injection period. The angiographic procedure was filmed continuously at a frame rate of 42 per second. The patient's heart rate during the examination was monitored electrocardiographically to obtain very accurate timing.

Analysis of the films demonstrated clearly the pulsatile nature of the pulmonary blood flow in the large main pulmonary arteries and also in the smaller segmental and lobular branches. The intermittently varying density of the blush due to contrast medium in the small vessels of the lung lobule indicated a pulsatile flow in the arterioles, capillary network, and venules. This variation in density was related to the heart beat. In the small veins too a distinct pulsatile flow was demonstrated in these studies.

To substantiate these findings four cine films are shown demonstrating different patients in whom injections had been made at various sites of the lung; each film demonstrates the pulsatile nature of the pulmonary circulation in individual segments of the pulmonary vasculature.

Left Ventricular Function in Man

By D. G. Greene, C. Grant, and I. L. Bunnell (*all introduced by Sir George Pickering*)

Left ventricular stroke work and left ventricular end-diastolic volume have been calculated in 25 patients from continuous recordings of left ventricular pressure and serial estimations of left ventricular volume made 6 or 12 times per second by the technique of Arvidsson. Of these, 7 patients had essentially normal left ventricles, 5 had outflow obstruction, 10 had regurgitation of aortic or mitral valves or both, and 3 had myocardial disease. As compared with the normal groups the obstructed ventricles performed more work without dilatation, and those with myocardial disease performed no increased work though they were dilated. The more dilated the ventricle the more work was performed in the patients with valvular regurgitation. Though only one observation was made in each patient the ascending limb of a Starling curve is suggested by the data from the regurgitation groups. Since the end-diastolic pressure was not proportional to either stroke work or end-diastolic volume the Starling effect does not account entirely for the increased stroke work. The left ventricle in these patients responded to a pressure load by hypertrophy without dilatation, and to a volume load by dilatation and hypertrophy. A myocardial lesion impaired the ability of the heart to do work even with dilatation.

Mitral Valve Disease with Ventricular Septal Defect

By Arthur Hollman and M. Hamed (*introduced*)

In 230 consecutive patients with ventricular septal defect there were 8 with mitral valve disease, excluding those with corrected transposition of the great vessels. Of the 8, 6 were among the total of 145 who had surgical closure of the ventricular septal defect performed.

The mitral lesion was dominantly stenotic in five and incompetent in two. There was severe pulmonary hypertension in all patients, which caused the systolic bruit of the ventricular septal defect to be shorter and softer than usual. This threw into prominence the mitral murmurs and enabled the pan-systolic murmur of mitral incompetence to be readily distinguished from that of the ventricular septal defect. Pulmonary arteriography and radioactive gas studies showed a diminution of blood flow at the lung bases in the severe cases.

One patient had mitral valvotomy performed at open-heart surgery and was found to have a supravalvar stenosis. The operative and necropsy findings in the other patients are presented, and a resumé given of the valve anatomy in other reported cases.

Relation Between Systemic Embolism and a Large Left Atrial Appendix in Mitral Stenosis

By Walter Somerville and Jane Chambers (*introduced*)

The part taken by the left atrial appendix in the formation of systemic embolism in mitral stenosis has not been established up to now.

In a personal series of 525 successive patients with mitral stenosis, the incidence of systemic embolism was 48 per cent in those with a large left atrial appendix compared with 14 per cent in those with a small appendix, a highly significant difference ($\chi^2=45{\cdot}93$). Of 165 patients with systemic emboli drawn from the same population, the appendix was large in 53 per cent and very small in 12 per cent. Recurrent emboli affected 63 patients (38%) of this group; the appendix was large in 63 per cent of them and very small in 14 per cent. The incidence of large and very small appendices was 26 and 34 per cent respectively in 360 patients without emboli. There is a significantly greater chance of a patient with mitral stenosis getting an embolus with advancing age, but this risk holds only for those with a large or medium appendix ($\chi^2=13{\cdot}76$–$12{\cdot}97$), not when the appendix is small ($\chi^2=3{\cdot}53$).

In a study of 15 patients who developed embolism months or years after mitral valvotomy, a large atrial appendix had not been amputated in 12. It may be concluded then that a large atrial appendix is an important factor in the causation of systemic embolism in mitral stenosis. Atrial appendectomy is an added assurance against future embolism when mitral valvotomy is performed.

Endoscopic Cinephotography in the Beating Dog Heart

By Andrew Logan, J. D. Wade, and D. E. M. Taylor (*both introduced*)

Previous direct observations of the heart valves in the beating heart or under simulated conditions have had disadvantages due either to the poor state of an isolated perfused heart working under a load or to the use of a pulse duplicator, which does not take account of active mechanical movement of the myocardium associated with the valve ring and papillary muscles. In addition the use of a saline or Ringer-based solution does not approximate to the hydrodynamic properties of blood. We have developed a technique for high-speed cinephotography of the valves in an *in situ* beating dog heart, which requires artificial perfusion with an optically clear solution only for the period of photography. Simultaneous recordings of the pressure change on either side of the valve under study, the cardiac output, and the electrocardiogram are also taken. Films illustrating some of the results of using these techniques on the mitral and aortic valves are shown.